

## ABSTRACT OF THE DISCLOSURE

Methods and systems for modifying at least one synapse of a physical neural network. A physical neural network implemented as an adaptive neural network can be provided, which includes one or more neurons and one or more synapses thereof, wherein the neurons and synapses are formed from a plurality of nanoparticles disposed within a dielectric solution in association with one or more pre-synaptic electrodes and one or more post-synaptic electrodes and an applied electric field. At least one pulse can be generated from one or more of the neurons to one or more of the pre-synaptic electrodes of a succeeding neuron and one or more post-synaptic electrodes of one or more of the neurons of the physical neural network, thereby strengthening at least one nanoparticle of a plurality of nanoparticles disposed within the dielectric solution and at least one synapse thereof.